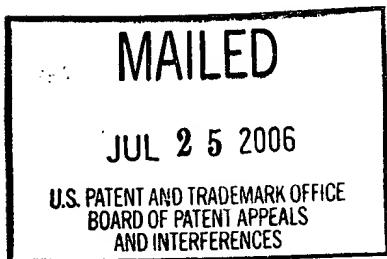


The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES



Ex parte JOHN WHITMAN and  
JOHN DAVLIN

Appeal No. 2006-1362  
Application No. 09/542,783

ON BRIEF

Before KRASS, JERRY SMITH, and MACDONALD, Administrative Patent Judges.

JERRY SMITH, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on the appeal under 35 U.S.C. § 134 from the examiner's rejection of claims 1-17. Pending claims 18-87 have been withdrawn from consideration by the examiner<sup>1</sup>. Claims 88-101 have been cancelled.

The disclosed invention pertains to a method for disposing material on a semiconductor device structure having a surface and at least one recess formed in the surface. More

<sup>1</sup> Appellants' request that claims 18-87 should be brought back into consideration in this application is not within our jurisdiction to decide.

particularly, the material is disposed on the surface so as to substantially fill the at least one recess and such that an upper surface of the material over or within the at least recess being substantially planar.

Representative claim 1 is reproduced as follows

1. A method for disposing a material on a semiconductor device structure, comprising:  
providing a semiconductor device structure including a surface and at least one recess formed in said surface;  
disposing said material on said surface so as to substantially fill said at least one recess, said material covering said surface having a thickness less than a depth of said at least one recess without subsequently removing said material from said surface, an upper surface of at least a portion of said material over or within said at least one recess being substantially planar.

The examiner relies on the following references:

Lin et al. (Lin)	6,046,083	Apr. 04, 2000 (filed June 26, 1998)
Yoshihara	6,117,486	Sep. 12, 2000 (filed Mar. 25, 1998)
Kikuchi et al. (Kikuchi)	6,278,153	Aug. 21, 2001 (filed Oct. 19, 1999)
Park et al. (Park)	6,326,282	Dec. 04, 2001 (filed Apr. 14, 1999)

The following rejections are on appeal before us:

1. Claims 1, 2, 8, 9, 11, 16 and 17 stand rejected under 35 U.S.C. § 102(e) as being anticipated by the disclosure of Kikuchi.

2. Claims 3-7 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the teachings of Kikuchi in view of Yoshihara.

3. Claim 10 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over the teachings of Kikuchi in view of Lin.

4. Claims 12-15 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the teachings of Kikuchi in view of Park.

Rather than repeat the arguments of appellants or the examiner, we make reference to the briefs and the answer for the respective details thereof.

OPINION

We have carefully considered the subject matter on appeal, the rejections advanced by the examiner and the evidence of anticipation and obviousness relied upon by the examiner as support for the rejections. We have, likewise, reviewed and taken into consideration, in reaching our decision, the appellants' arguments set forth in the briefs along with the examiner's rationale in support of the rejections and arguments in rebuttal set forth in the examiner's answer.

It is our view, after consideration of the record before us, that the evidence relied on by the examiner supports the examiner's rejection of claims 3-7 but does not support the examiner's rejections with respect to any of the other claims on

appeal. Accordingly, we affirm-in-part. We also enter a new ground of rejection against claim 1 using our authority under 37 CFR § 41.50(b).

We consider first the rejection of claims 1, 2, 8, 9, 11, 16 and 17 as being anticipated by Kikuchi. Anticipation is established only when a single prior art reference discloses, expressly or under the principles of inherency, each and every element of a claimed invention as well as disclosing structure which is capable of performing the recited functional limitations. RCA Corp. v. Applied Digital Data Systems, Inc., 730 F.2d 1440, 1444, 221 USPQ 385, 388 (Fed. Cir.); cert. dismissed, 468 U.S. 1228 (1984); W.L. Gore and Associates, Inc. v. Garlock, Inc., 721 F.2d 1540, 1554, 220 USPQ 303, 313 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984).

The examiner has indicated how the invention of these claims is deemed to be fully met by the disclosure of Kikuchi [answer, pages 3-5]. With respect to independent claim 1, appellants argue that Kikuchi fails to disclose the claimed step of disposing material in such a way that an upper surface of at least a portion of the material over or within the at least one recess is substantially planar. Appellants assert that there is no express description in Kikuchi that the surface of resist 20 is planar, and the inclusion of a straight line to depict the surface 20 in the drawings does not adequately indicate that the

surface is substantially planar. Appellants refer to the prior art and their background information as evidence that conventional spin-on processes do not necessarily result in a planar surface as claimed. Appellants also argue that Kikuchi includes no express or inherent description that the thickness of portions of the resist that cover the surface of the illustrated semiconductor device structure are less than a depth of at least one resist-filled recess therein [brief, pages 9-12].

The examiner responds that Kikuchi "appears" to teach the claimed invention in its Figure 6D. The examiner notes that this figure shows the relative thickness of claim 1 and the surface of resist layer 20 over the recess appears to be substantially planar. The examiner asserts that the purpose of spin coating during deposition is to form a layer having a planar surface. The examiner notes that claim 1 does not recite how the planarization is conducted that can be different from that of Kikuchi [answer, pages 8-11].

Appellants respond that Kikuchi includes no express or inherent written description that any portion of the spin-coated resist described therein is substantially planar or that the thickness of portions of the resist that cover the surface of the semiconductor device structure are less than a depth of at least one resist-filled recess therein. Appellants reiterate that the surface of a resist layer may not planarize on its own.

Appellants argue that the drawings cannot be relied on to substantiate the examiner's findings [reply brief, pages 2-4].

We will not sustain the examiner's rejection of the claims based on anticipation. As argued by appellants, Kikuchi's drawings by themselves can not be relied on to disclose that the upper surface in Figure 6D is "substantially planar" as claimed. In the art of semiconductor structures, differences in planarity can be measured in Angstroms, and one can not assume that such differences would or could be represented in a drawing.

Additionally, the examiner has cited a reference to Yoshihara which discloses that spin coating, by itself, does not typically result in a planar surface. Therefore, the examiner's position that spin coating is designed to yield a planar surface is not supported on this record and is not specifically disclosed by Kikuchi.

We now consider the rejection of claims 3-7 under 35 U.S.C. § 103 based on Kikuchi and Yoshihara. In rejecting claims under 35 U.S.C. § 103, it is incumbent upon the examiner to establish a factual basis to support the legal conclusion of obviousness. See In re Fine, 837 F.2d 1071, 1073, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). In so doing, the examiner is expected to make the factual determinations set forth in Graham v. John Deere Co., 383 U.S. 1, 17, 148 USPQ 459, 467 (1966). The examiner must articulate reasons for the examiner's decision. In re Lee, 277

F.3d 1338, 1342, 61 USPQ2d 1430, 1434 (Fed. Cir. 2002). In particular, the examiner must show that there is a teaching, motivation, or suggestion of a motivation to combine references relied on as evidence of obviousness. Id. at 1343, 61 USPQ2d at 1433-34. The examiner cannot simply reach conclusions based on the examiner's own understanding or experience - or on his or her assessment of what would be basic knowledge or common sense. Rather, the examiner must point to some concrete evidence in the record in support of these findings. In re Zurko, 258 F.3d 1379, 1386, 59 USPQ2d 1693, 1697 (Fed. Cir. 2001). Thus the examiner must not only assure that the requisite findings are made, based on evidence of record, but must also explain the reasoning by which the findings are deemed to support the examiner's conclusion. However, a suggestion, teaching, or motivation to combine the relevant prior art teachings does not have to be found explicitly in the prior art, as the teaching, motivation, or suggestion may be implicit from the prior art as a whole, rather than expressly stated in the references. The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art. In re Kahn, 441 F.3d 977, 987, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006) (citing In re Kotzab, 217 F.3d 1365, 1370, 55 USPQ2d 1313 (Fed. Cir. 2000)). See also In re Thrift, 298 F.

3d 1357, 1363, 63 USPQ2d 2002, 2008 (Fed. Cir. 2002). These showings by the examiner are an essential part of complying with the burden of presenting a *prima facie* case of obviousness. Note In re Oetiker, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992). If that burden is met, the burden then shifts to the applicant to overcome the *prima facie* case with argument and/or evidence. Obviousness is then determined on the basis of the evidence as a whole and the relative persuasiveness of the arguments. See id.; In re Hedges, 783 F.2d 1038, 1039, 228 USPQ 685, 686 (Fed. Cir. 1986); In re Piasecki, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984); and In re Rinehart, 531 F.2d 1048, 1052, 189 USPQ 143, 147 (CCPA 1976). Only those arguments actually made by appellants have been considered in this decision. Arguments which appellants could have made but chose not to make in the brief have not been considered and are deemed to be waived [see 37 CFR § 41.37(c)(1)(vii) (2004)].

The examiner finds that Kikuchi teaches the claimed invention except for decreasing a rate of spinning followed by an increasing of the rate of spinning. The examiner cites Yoshihara as teaching these steps. The examiner finds that it would have been obvious to the artisan to apply the teachings of Yoshihara to the spin coating of Kikuchi [answer, pages 5-6].

With respect to claim 3, appellants argue that Kikuchi does not teach substantially planar surfaces over or within the

recesses as argued with respect to claim 1, and that the Yoshihara technique applied to a nonplanar surface cannot result in a planar surface [brief, pages 14-15]. Appellants argue, therefore, that there is no motivation to combine the teachings of Kikuchi with Yoshihara. With respect to claim 5, appellants additionally argue that neither Kikuchi nor Yoshihara teaches an initial spinning of about 1,000 rpm [id., page 16].

The examiner responds that the artisan would have been motivated to apply the advantageous spin coating technique taught by Yoshihara to the spin coating used in Kikuchi because Yoshihara teaches how to achieve a coating of substantially uniform thickness [answer, pages 15-16].

Appellants respond that neither Kikuchi nor Yoshihara teaches or suggests that at least a portion of a surface material that has been introduced into at least one recess of a semiconductor device structure may be substantially planar as required by claim 1. Appellants assert that it is not possible for a layer which has a substantially uniform thickness and which is formed over a nonplanar surface to have a planar surface. Appellants also argue that Yoshihara does not teach re-increasing the spinning rate gradually as recited in claim 3. Finally, appellants assert that there is no teaching of the spinning rate recited in claim 5 [reply brief, pages 5-6].

We will sustain the examiner's rejection of claims 3-7 based on the collective teachings of Kikuchi and Yoshihara.

Although Kikuchi does not disclose that the upper surface of his device is substantially planar as discussed above, Yoshihara teaches a spin coating technique which results in a layer of uniform thickness (substantially planar). We find that the teaching of uniform thickness to mean that the thickness of the layer will be the same over all portions of the device including the recesses on the surface. In other words, Yoshihara teaches that the thickness of the layer on the surface of the device is the same as the thickness of the layer within the recesses.

Although this does not result in a substantially planar surface over the entire semiconductor device, claim 1 only requires that the upper surface be substantially planar "over or within said at least one recess." We find that the technique taught by Yoshihara would result in a layer of uniform thickness within the recesses of Kikuchi and that this layer of uniform thickness within the recess would result in an upper surface of the material within the recess being substantially planar. We agree with the examiner that the artisan would have been motivated to apply the spin coating technique of Yoshihara to the device of Kikuchi because there is no indication on this record that Kikuchi desires something other than a uniform thickness of layers in forming his devices. We also find that via holes as

taught by Kikuchi are typically deeper, or have greater thickness, than layers which are spin coated thereon. With respect to the recitation of gradually increasing the rate of spinning in claim 3, we find that this broad recitation would have been obvious to the artisan in view of the collective teachings of Kikuchi and Yoshihara. Spin rates and times would be a function of the type of material being disposed on the surface so as to achieve a coating of uniform thickness. The artisan would have been able to determine the optimum rates of spinning as taught by Yoshihara to achieve a uniform thickness based on the materials being disposed on the surface. This also applies to the spinning rate of claim 5. We also note, however, that the method of claim 3 actually has three different spinning rates. Yoshihara clearly teaches that one of the spinning rates effected therein is at a rate of 1,000 rpm.

We now consider the rejection of claim 10 based on Kikuchi and Lin and the rejection of claims 12-15 based on Kikuchi and Park. As noted above, Kikuchi can not be relied on as teaching a substantially planar surface. Although Yoshihara does teach a spin coating technique for achieving a substantially planar surface over the recess area, Yoshihara is not applied in these rejections. Therefore, we do not sustain the examiner's rejections of these claims because they rely on the improper finding that Kikuchi teaches a substantially planar surface.

We enter the following new ground of rejection of claim 1 using our authority under 37 CFR § 41.50(b). Claim 1 is rejected under 35 U.S.C. § 103(a) as being unpatentable over the collective teachings of Kikuchi and Yoshihara. In our affirmance of the rejection of claim 3 above, we explained how the collective teachings of Kikuchi and Yoshihara render the invention of claim 3 obvious. Since claim 3 depends from claim 1, then claim 1 is unpatentable over the teachings of Kikuchi and Yoshihara for the same reasons discussed above with respect to claim 3. As discussed above, only Yoshihara teaches the formation of a substantially planar layer. Therefore, on this record, only rejections which rely on Yoshihara can support a finding of a substantially planar surface. We leave it to the examiner to determine whether appropriate rejections can be made against any of the other claims on appeal.

In summary, we have sustained the examiner's rejection of claims 3-7, but we have not sustained the examiner's rejections with respect to claims 1, 2 and 8-17. Therefore, the decision of the examiner rejecting claims 1-17 is affirmed-in-part. We have also entered a new ground of rejection against claim 1.

Regarding the affirmed rejection, 37 CFR § 41.52(a)(1) provides "[a]ppellant may file a single request for rehearing within two months from the date of the original decision of the Board."

In addition to affirming the examiner's rejection of one or more claims, this decision contains a new ground of rejection pursuant to 37 CFR § 41.50(b) (effective September 13, 2004, 69 Fed. Reg. 49960 (August 12, 2004), 1286 Off. Gaz. Pat. Office 21 (September 7, 2004)). 37 CFR § 41.50(b) provides "[a] new ground of rejection pursuant to this paragraph shall not be considered final for judicial review."

37 CFR § 41.50(b) also provides that the appellant, WITHIN TWO MONTHS FROM THE DATE OF THE DECISION, must exercise one of the following two options with respect to the new ground of rejection to avoid termination of the appeal as to the rejected claims:

(1) *Reopen prosecution.* Submit an appropriate amendment of the claims so rejected or new evidence relating to the claims so rejected, or both, and have the matter reconsidered by the examiner, in which event the proceeding will be remanded to the examiner. . . .

(2) *Request rehearing.* Request that the proceeding be reheard under § 41.52 by the Board upon the same record. . . .

Should the appellant elect to prosecute further before the examiner pursuant to 37 CFR § 41.50(b)(1), in order to preserve the right to seek review under 35 U.S.C. §§ 141 or 145 with respect to the affirmed rejection, the effective date of the affirmance is deferred until conclusion of the prosecution before

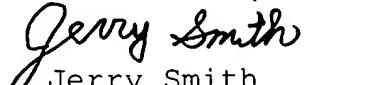
the examiner unless, as a mere incident to the limited prosecution, the affirmed rejection is overcome.

If the appellant elects prosecution before the examiner and this does not result in allowance of the application, abandonment or a second appeal, this case should be returned to the Board of Patent Appeals and Interferences for final action on the affirmed rejection, including any timely request for rehearing thereof.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a)(1)(iv).

AFFIRMED-IN-PART

37 CFR § 41.50(b)

  
Errol A. Krass )  
Administrative Patent Judge )  
)  
  
  
Jerry Smith ) BOARD OF PATENT  
Administrative Patent Judge )  
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